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Effect of thioctic acid enantiometers on cardiac and renal hypertensive damage

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Arterial hypertension is accompanied by significant cardiovascular and renal changes as well as by increased production of reactive oxygen species (ROS)

Spontaneously hypertensive rats (SHR) are a widely used animal model in hypertension research. They are normotensive at birth and develop hypertension gradually. From the 6th month hypertension becomes stable and is accompanied by the development of cardiovascular, renal and brain injury as well as ROS production increase.

This study has evaluated in 20-week-old SHR and normotensive Wistar Kyoto (WKY) rats the effect of treatment for 2 weeks with a daily dose of 12.5 nM/Kg racemic (+/-)-, (+)- or (-)-thioctic acid on heart and kidney oxidative stress and microanatomy. Loose ligation of the right sciatic nerve (Chronic constriction injury, CCI) was made to increase oxidative stress condition.

Systolic blood pressure was unaffected by treatment with thioctic acid. In the heart hypertension and CCI were accompanied by left ventricular hypertrophy, increased size of cardiocytes and signs of fibrosis. In the kidney hypertension and CCI increased oxidative damage with obvious signs of glomerular and tubular changes. (+)-Thioctic acid and to a lesser extent (+/-)-thioctic acid countered in part these changes which were unaffected or worsened by (-)-thioctic acid.

These data indicate that the naturally occurring enantiomer (+) - thioctic acid has a protective effect on hypertension/oxidative stress-related cardiac or renal microanatomical changes. (-)-Thioctic acid which is not present in nature and derives from chemical processes of synthesis of the compound has probably a negative activity on parameters investigated. Its presence in the racemic thioctic acid is probably the reason of the lower pharmacological activity noticeable with this form of the compound. Appropriate antioxidant strategy could be helpful in combination with antihypertensive drugs in the treatment of hypertensive organ damage. The more pronounced effect of (+)-thioctic acid may have consequences worthwhile of being investigated in clinical studies.

Keywords: Arterial hypertension, thioctic acid, heart microanatomy, kidney microanatomy.